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10/774,695

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Tuomo Lehtonen

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* TUOMO LEHTONEN

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Appeal 2009-003118  
Application 10/774,695  
Technology Center 2800

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Decided: September 22, 2009

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Before TERRY J. OWENS, PETER F. KRATZ, and MARK NAGUMO,  
*Administrative Patent Judges.*

NAGUMO, *Administrative Patent Judge.*

DECISION ON APPEAL

A. Introduction<sup>1</sup>

Tuomo Lehtonen (“Lehtonen”) timely appeals under 35 U.S.C. § 134(a) from the final rejection<sup>2</sup> of claims 1 and 3-17, which are all of the pending claims. We have jurisdiction under 35 U.S.C. § 6. We AFFIRM-IN-PART.

The subject matter on appeal relates to an acceleration sensor based on a measurement of the capacitance of a pair of electrodes, one of which moves relative to the other in response to an acceleration of the sensor, thereby changing that capacitance. According to the 695 Specification, preferably, the change in capacitance between the movable electrode and the stationary electrode has been enhanced by the shape of the electrodes.

Representative Claim 1 is reproduced from the Claims Appendix to the Principal Brief on Appeal:

1. A capacitive acceleration sensor comprising
  - at least one pair of electrodes such, that each pair of electrodes comprises
    - a movable electrode, which is responsive to the acceleration, and
    - at least one stationary plate portion,

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<sup>1</sup> Application 10/774,695, *Capacitive Acceleration Sensor*, filed 10 February 2004, claiming the benefit under 35 U.S.C. § 119(a) of a Finnish application filed 11 February 2003. The specification is referred to as the “695 Specification,” and is cited as “Spec.” The real party in interest is listed as VTI Technologies OY. (Brief on Appeal, filed 12 July 2006 (“Br.”), 1-2.)

<sup>2</sup> Office action mailed 5 October 2005 (“Final Rejection”; cited as “FR”).

wherein each pair of electrodes further comprises an axis of rotation essentially forming a common axis such, that

the movable electrode of the acceleration sensor is rigidly supported at the axis of rotation such, that the movable electrode is free to turn in a rotational motion about the axis of rotation, and that

a capacitance change between the movable electrode in rotational motion and the plate portion is enhanced by means of the electrodes,

wherein the *capacitance change* between the movable electrode in rotational motion and the plate portion *is enhanced by means of the shape of the electrodes.*

(Br., Claims App. 1; indentation and emphasis added.)

Claims 12-14 specify certain shapes (triangle, drop, hammer) of the pair of electrodes.

The Examiner has maintained the following grounds of rejection:<sup>3</sup>

A. Claims 1, 3-11, and 15-17 stand rejected under 35 U.S.C. § 102(b) in view of Menzel.<sup>4</sup>

B. Claims 12-14 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Menzel and Reddi.<sup>5</sup>

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<sup>3</sup> Examiner's Answer mailed 27 March 2007. ("Ans.").

<sup>4</sup> Christoph P. Menzel, *Capacitor Center of Area Sensitivity in Angular Motion Micro-Electromechanical Systems*, U.S. Patent 6,000,287 (1999).

Lehtonen contends (Br. 5-7) that the Examiner erred in finding that the alteration of the length of the moving electrode taught by Menzel to obtain the desired sensitivity for the capacitive sensor meets the requirement in claim 1 that “the capacitance change between the movable electrode in rotational motion and the plate portion is enhanced by means of the shape of the electrodes.” According to Lehtonen, the Examiner erred further in finding that Reddi teaches that the pair of electrodes for the capacitive acceleration sensor may be of any shape. (Br. 10-11.)

The Examiner maintains that the term “shape,” as used in claim 1 and as defined in the 695 Specification, is broad enough to encompass changes in the length of a rectangular electrode. (FR 3-4.) Moreover, the Examiner finds that although Menzel does not teach any of the electrode shapes recited in claims 14-16, Reddi teaches that bar 10 may have any shape. (*Id.*) The Examiner concludes that it would have been obvious to use electrodes having the shapes of a triangle, drop, or hammer recited in claims 14-16.

The issues dispositive of this appeal are:

Is the limitation, “enhanced by means of the shape,” sufficiently narrow to exclude optimization of sensor response by changing the length of a rectangular electrode? and

Does Reddi teach that an electrode may have any shape?

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<sup>5</sup> M. Mahadeva Reddi and Donald F. DeCleene, *Linear and Rotational Accelerometer*, U.S. Patent 5,831,164 (1988).

B. Findings of Fact

Findings of fact throughout this Opinion are supported by a preponderance of the evidence of record.

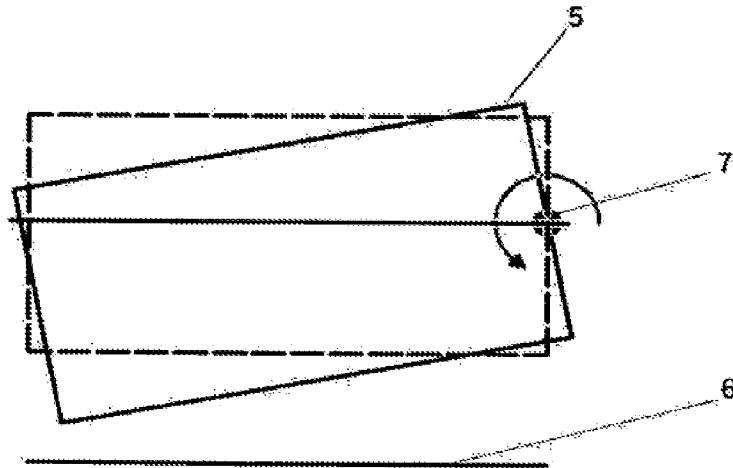
The 695 Specification

1. The 695 Specification explains that the capacitance between two electrodes increases as the distance between the two electrodes decreases. (Spec. 3, ¶ [0009].)
2. Thus, according to the 695 Specification, the change in capacitance of a pair of electrodes, one of which is movable with respect to the other in response to an acceleration, can form the basis of a device to measure the acceleration. (Spec. 2, ¶ [0006].)
3. According to the 695 Specification, an object of the invention is to “improve the capacitance sensitivity of a pair of electrodes based on rotational motion.” (Spec. 3, ¶ [0011].)
4. Each pair of electrodes is said to comprise a stationary plate electrode and a movable electrode (Spec. 3, ¶ [0012]) that is “rigidly supported at the axis of rotation” about which the movable electrode is free to rotate (*id.* at ¶ [0013]), wherein the capacitance change due to the rotational motion is “enhanced by the electrodes (*id.* at ¶ [0014]).”
5. In the words of the 695 Specification, “[p]referably, the change in capacitance between the movable electrode in rotational motion and the plate portion has been enhanced by the shape of the electrodes.” (Spec. 4, ¶ [0015].)

6. Notwithstanding the characterization, *supra*, that the movable electrode is free to rotate about the supporting axis, in a preferred embodiment, the movable electrode is said to have essentially two support points, springs associated with these points providing a degree of rotational freedom to the movable electrode about the axis of rotation. (Spec. 4,

¶ [0017].)

7. A side view of the “functional structure” of pair of electrodes (Spec. 8, ¶ [0044]) is provided in Figure 3, which is reproduced below:



{ Figure 3 shows a capacitive sensor }

8. According to the 695 Specification, the sensor comprises movable electrode 5, stationary electrode 6, and axis of rotation 7. (Spec. 8,

¶ [0044].)<sup>6</sup>

9. Movable electrode 5 “is rigidly supported at the axis of rotation 7” and is free to rotate about that axis. (Spec. 9, ¶ [0045].)

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<sup>6</sup> For clarity, element numbers are emphasized in bold font throughout this Opinion without regard to their presentation in the original

10. According to the 695 Specification, “[w]hen the movable electrode 5 rotates after the rotational motion to a lower position, the capacitance between the surfaces 5, 6 increases as the distance between the surfaces 5, 6 decreases.” (Spec. 9, ¶ [0046].)

11. The 695 Specification explains, “[t]he capacitance between the surfaces 5, 6 in the pair of electrodes of the acceleration sensor, according to the present invention, is unevenly distributed over the surfaces 5 and 6, since the distance between the surfaces 5, 6 varies.” (Spec. 9, ¶ [0047].)

12. The 695 Specification states further:

In the acceleration sensor according to the present invention, the change in capacitance of the movable electrode in rotational motion is enhanced by means of the shape of the pair of electrodes in comparison with a pair of electrodes of rectangular shape. The enhancement of capacitance change is based on the unevenness in electrode distance caused by the rotational motion.

(Spec. 9, ¶ [0048].)

Menzel

13. Menzel describes capacitively sensed angular motion micro-electromechanical (“MEMS”) systems useful as microaccelerometers. (Menzel, col. 1, l. 11-12.)

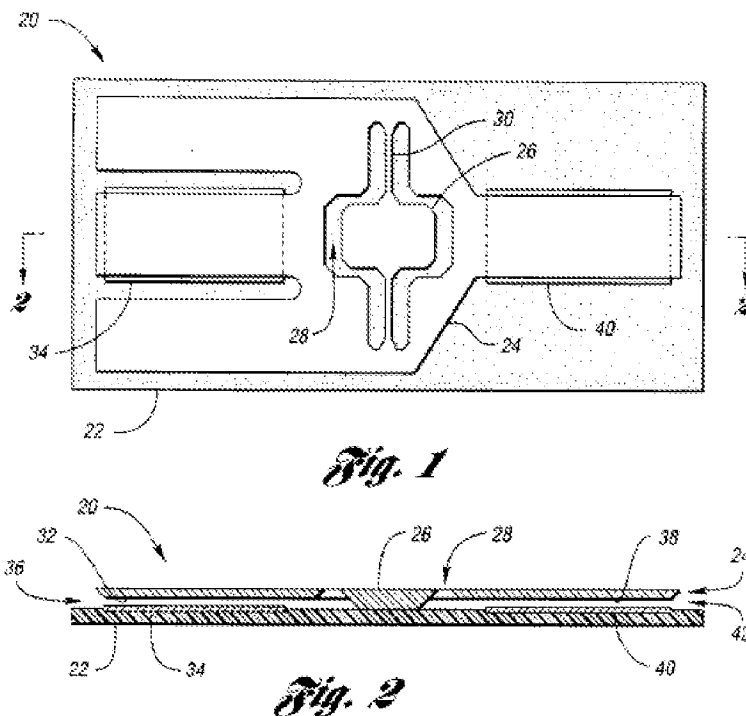
14. According to Menzel, the microaccelerometers have substantially parallel movable and stationary electrodes in which the movable electrodes rotate through a dielectric fluid about an axis of rotation parallel to the movable electrode. (Menzel, col. 1, l. 11 and ll. 55-60.)



15. Menzel teaches that, in a preferred embodiment, the stationary electrode and the movable electrode are rectangular. (Menzel, col. 1, ll. 66-67.)

16. According to Menzel, “[e]ach electrode has sides defining a width parallel to the axis of rotation,” and the sensitivity of the sensor may be set by changing the stationary electrode length. (Menzel, col. 1, l. 67-col. 2, l. 4.)

17. Menzel shows a capacitive microaccelerometer in the top view (Figure 1) and side view (Figure 2), which are reproduced below:



{ Figures 1 and 2 are said to show a top and side view of a sensor. }

18. The microaccelerometer 20 comprises a substrate 22 and a movable plate 24 mounted on pedestal 26 via torsional members 30 defined by apertures 28 in plate 24. (Menzel, col. 3, ll. 15-24.)

19. According to Menzel, movable plate 24 is formed from a plate having uniform density into a trident structure with the handle to the right and the prongs to the left. (Menzel, col. 3, ll. 25-28.)

20. As a result, the mass of the handle to the right differs from the mass of the prongs to the left, and acceleration in a direction normal to the substrate will cause movable plate 24 to rotate about torsional members 30, moving one end of movable plate 24 closer to the substrate and the other end farther from the substrate. (Menzel, col. 3, ll. 28-35.)

21. First electrode 32, located on the bottom of the middle prong on the left side of movable plate 24, and second electrode 34, located on the top surface of substrate 22, forming first variable capacitor 36. (Menzel, col. 3, ll. 35-38.)

22. Second variable capacitor 42 is formed on the right hand side by similarly situated electrodes 38 and 40. (Menzel, col. 3, ll. 38-45.)

#### Reddi

23. Reddi describes a linear and rotational accelerometer based on detector that measures the displacement of a “proof mass.” (Reddi, col. 2, ll. 33-45.)

24. According to Reddi, “[t]he detector includes a plurality of capacitors, each capacitor having substantially the same construction and comprising a fixed electrode located opposite to a surface of the flat bar.” (Reddi, col. 2, ll. 44-47.)

25. Reddi further describes an element in Figures 1A and 1B as being an imbalanced or eccentric flat bar 10 that acts as a proof mass. (Reddi, col. 3, ll. 52-54.)

26. In Reddi's words, "[t]he bar 10 is mounted between four fixed electrodes 17, 18, 19 and 20 which serve as capacitor plates to sense the angular excursion of the bar 10 from a null position." (Reddi, col. 3, ll. 61-64.)

27. Reddi teaches that "[a]ny shape of the bar 10 and the hinge 27 may be used." (Reddi, col. 6, ll. 30-31.)

#### C. Discussion

As the Appellant, Lehtonen bears the procedural burden of showing harmful error in the Examiner's rejections. *See, e.g., Gechter v. Davidson*, 116 F.3d 1454, 1460 (Fed. Cir. 1997) ("[W]e expect that the Board's anticipation analysis be conducted on a limitation by limitation basis, with specific fact findings for each *contested* limitation and satisfactory explanations for such findings.") (emphasis added); *In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006) ("On appeal to the Board, an applicant can overcome a rejection [under § 103] by showing insufficient evidence of *prima facie* obviousness") (citation and internal quote omitted). Untimely arguments not presented in the Principal Brief on Appeal have been waived. 37 C.F.R. § 41.37(c)(1)(vii), second sentence (2009).

It is well settled that, during examination of the claims in an application,

the PTO applies to the verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification."

*In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997). It is improper to read limitations from preferred embodiments in the specification into the claims.

*In re Am. Acad. Sci. Tech. Ctr.*, 367 F.3d 1359, 1369 (Fed. Cir. 2004).

Initially, we note that the only claim subject to the rejection by anticipation in view of Menzel substantively disputed by Lehtonen is claim 1. The traverses of the rejection of the remaining claims (Br. 7-9) are merely assertions that the additional limitations are neither disclosed nor suggested by Menzel. Such arguments, at most, point out what the claims recite, and are not, under the regulations governing appeals to the Board, arguments for separate patentability. 37 C.F.R. § 41.37(c)(1)(vii), last sentence (2009). Accordingly, we limit our consideration to the disputed limitations of claim 1.

Lehtonen does not dispute the Examiner's findings that Menzel describes capacitive acceleration sensors comprising a pair of electrodes, one fixed, the other movable about an axis of rotation. The only limitation of claim 1 not met by Menzel, according to Lehtonen, is the last, which reads, "the capacitance change between the movable electrode in rotational motion and the plate portion *is enhanced by means of the shape of the electrodes.*" Lehtonen argues that Menzel only changes the size of a

rectangular electrode (para. bridging Br. 5-6), and that “this is different than changing the shape of the electrode to enhance sensitivity” (*id.* at 6, first full para.)

Lehtonen does not direct our attention to any definition of the term “shape” in claim 1 or in the supporting 695 Specification that excludes changing the shape of a rectangle by changing the length relative to the width. A square is a special case of a rectangle, and uniformly lengthening opposite sides of a square in the same direction produces a series of rectangles, each of which has a different shape—a different aspect ratio—than the others. Thus, Menzel’s teaching that the sensitivity of the sensor may be adjusted by changing the length of the stationary electrode (Menzel, col. 2, ll. 2-4), supports the Examiner’s finding that the disputed limitation is met, i.e., that the capacitance change is “enhanced by means of the shape of the electrodes.”

We observe further that the plain language of claim 1 does not provide the basis is for determining whether the capacitance change has been “enhanced.” The broad description of the invention provided by the 695 Specification, “[p]referably, the change in capacitance between the movable electrode in rotational motion and the plate portion has been enhanced by the shape of the electrodes” (Spec. 4, ¶ [0015]) offers no further enlightenment. Nor does the plain language of claim 1 define the limitation, “change in capacitance . . . enhanced by the shape of the electrodes.” The broad description in the Specification quoted immediately *supra* is essentially the same as the claim language.

It has not escaped our attention that various embodiments of the invention are described, e.g., at page 8, paragraph [0044] through page 10, paragraph [0048]. But consideration of these teachings tends to emphasize the scope of the subject matter covered by claim 1, rather than to narrow the scope. Figure 3, which is reproduced *supra* at 6, in particular, appears to show a rectangular electrode 5 that is rigidly supported on an axis 7 that lies parallel to stationary electrode 6. Axis 7 appears to hold movable rectangular electrode 5 along a line that is not parallel to the long edges of the electrode. Rotation about axis 7 thus brings disproportionately more of electrode 5 closer to stationary electrode 6 than would rotation about an axis parallel to the long edges of electrode 5. Holding electrode 5 fixed and translating axis 7 parallel to the position shown, but further from electrode 6 would result in a configuration of electrode 5 relative to electrode 6 having a greater “eccentricity.” The new pair of electrodes is fairly characterized as having a different “shape” than the first electrode pair. Other changes of the orientation and position of axis 7 on movable electrode 5 would result in still other differently shaped electrodes. Any sensor having a greater capacitance change upon rotation of the movable electrode 5 would be “enhanced” relative to the other, and would therefore, fall within the scope of claim 1. The 695 Specification describes still other, narrower embodiments of sensors, such as those shown in Figures 4 and 6-23.

During examination, Lehtonen has the opportunity to explore the scope and breadth of the claim language, recognize ambiguities, and impose clarification by amendment of the claims. However, on appeal, we shall not

read claim 1 narrowly by reading limitations of specific examples into the broad language of the claim. As the Federal Circuit explained,

[w]e decline to attempt to harmonize the applicants' interpretation with the application and prior art. Such an approach puts the burden in the wrong place. It is the applicants' burden to precisely define the invention, not the PTO's. *See* 35 U.S.C. § 112 ¶ 2 (“The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.”).

*Morris*, 127 F.3d at 1056.

Because Lehtonen has failed to demonstrate that the Examiner's interpretation of claim 1 is in error, we AFFIRM the rejection of claim 1 as anticipated by Menzel.

We REVERSE the rejection of claims 12-14, which depend from claim 1 and which recite specific shapes of electrodes, in view of the combined teachings of Menzel and Reddi. The bar 10, which the Examiner points to as providing teachings for arbitrary shapes of electrodes, is not an electrode: it is a “proof mass,” the motion of which is said to change the capacitance of the fixed electrodes. There is thus no evidentiary basis for the Examiner's conclusion that arbitrarily shaped electrodes, including the specifically shaped electrodes recited in claims 12-14, would have been obvious.

D. Order

We AFFIRM the rejection of claims 1, 3-11, and 15-17 under 35 U.S.C. § 102(b) in view of Menzel.

We REVERSE the rejection of claims 12-14 35 U.S.C. § 103(a) in view of the combined teachings of Menzel and Reddi.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED-IN-PART

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